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TAMPON FOR FEMININE HYGIENE, AS WELL AS PROCESS FOR ITS PRODUCTION  
[Tampon für die Frauenhygiene sowie Verfahren zu seiner Herstesllung]

Helmut Pietsch

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TITLE:	(54) : TAMPON FOR FEMININE HYGIENE, AS WELL AS PROCESS FOR ITS PRODUCTION
FOREIGN TITLE	[54A]: TAMPON FÜR DIE FRAUENHYGIENE SOWIE VERFAHREN ZU SEINER HERSTELLUNG

The invention relates to a tampon for feminine hygiene which /1\* consists of an absorbent body with a retrieval string that is attached to it.

These kinds of tampons are already known to the art. As a rule, their absorbent bodies are produced from synthetic wool or cotton wadding, whereas, the process may, for instance, be such that, initially, a tress is produced from the wadding, it is connected with the retrieval string by sewing it up or entwining it, and then it is rolled it into a preliminary body. This preliminary body is subsequently compressed in radial direction in a star press, for example, and, possibly, subjected to a heat treatment afterwards. The retrieval string must be wound up at the appropriate time in the manufacturing process and attached to the rear end of the tampon. If possible, immediately after the heat treatment, the finished tampon is packaged in appropriate foils with the attached retrieval string and sealed air-tight in this manner.

In other configurations of these types of tampons, the rolling of the preform is dispensed with and, instead, the cotton tress is swaged together in a zigzag shape. Producing the absorbent body not of synthetic wool or cotton wadding, but, instead, /2

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\*Number in the margin indicates pagination in the foreign text.

manufacturing shells from suitable fluid-permeable foils, for instance, nonwoven materials, which are filled with pulverized and, possibly, modified cellulose, or also with other appropriate water-absorbent materials, is also known to the art. The shells that are filled in this manner can then be folded in the shape of a funnel and packaged in a pressed or unpressed state.

The invention explained in the following text is applicable with all forms of absorbent tampon bodies, no matter whether these are pressed or unpressed absorbent bodies and regardless whether they consist of textile synthetic wool or cotton wadding, or other materials.

From the American patent document No. 2.458.685, attaching the retrieval string to the preformed absorbent body by sewing or entwining is known to the art. Moreover, from the German laid-open specification No. 1.965.774, the fixation of the retrieval string on the preformed absorbent body by agglutination, or with the assistance of a meltable means of assembly, is also known to the art. With all tampons, it is necessary to wind the retrieval string around in a coil-shape prior to packaging, and to attach the wind lap to the rear end of the tampon, as described in the American patent document No. 2.587.515. In this process, one may proceed in such a way that the retrieval string is immediately wound up during the manufacturing of the rolled preformed body and is pressed on the rear end by the winding fork as the preformed

body is stripped off, as can be deduced from the German patent document No. 1.491.162. Naturally, the process described there can only be used in the manufacturing of rolled tampons. If the string which has been wound around and attached to the preformed body falls off again in this process, this results in operational /3  
downtime and rejects.

The objective is to provide a tampon, as well as a process for its production, in which the retrieval string is folded together into a durable, small-volume wind lap, regardless of the composition and manufacturing process of the absorbent body.

In accordance with the invention, this objective is realized through a tampon which is characterized by the fact that, in any location of its longitudinal extension, the retrieval string partially consists of a material which does not shrink during the heat treatment and partially of an organic plastic material which does shrink during the heat treatment. As is known to the art, most strings made of synthetic organic plastic materials have experienced substantial stretching during their production. This stretching has the result that the chain-shaped organic macromolecules of which the strings are comprised are oriented in the direction of the string's longitudinal axis, whereas the stability of the string increases. However, in these types of strings, the molecules are in a meta-stable state of tension which can be discontinued again by heating them relatively gently, or by

treating them with appropriate solvents or solvent vapors. If this occurs, a sometimes considerable shrinkage of the string occurs.

These conditions are generally known to the art. The invention consists of the fact that the shrinkage experienced by these kinds of strings during heat treatment or treatment with an appropriate solvent or solvent vapors is utilized, in order to crimp tampon retrieval strings during the manufacturing of the tampon and to thereby pull the strings together into a relatively small-volume clew. This clew then lays itself against the rear end of the preformed tampon or of the finished tampon and will not /4 interfere during the further processing or when the tampon is packaged because, due to its crimping, it will always strive to maintain its small volume and not fall off again as a long-stretched string.

The invention can be realized in an advantageous manner if the retrieval string consists of cotton, synthetic wool, or a similar material, and has been sewed together with, at least, one string of a shrinkable organic plastic material over its entire length. In this process, the seam, preferably, should be arranged asymmetrically in relation to the tampon's cross-section. The string of the shrinkable organic plastic material which is used to sew up the retrieval string which, otherwise, consists of different materials, may also simultaneously be employed to connect the

retrieval string with the absorbent body, as is generally known to the art without the use of shrinkable strings.

In another configuration of the tampon according to the invention, the retrieval string may be built up from several intertwined strings of which, at least, one consists of a shrinkable organic plastic material. In addition, the intertwining or asymmetrical arrangement of a string seam is ascribed the effect that it facilitates the formation of a helical lap of the retrieval string.

In an additional configuration of the tampon according to the invention, the retrieval string consists of, at least, one bicomponent string, one component of which is an organic plastic material which does not shrink during heat treatments and the other component of which is an organic plastic material which shrinks during heat treatments. These types of bicomponent strings are also generally known to the art. In the realization of the invention, they can be used to advantage.

As the heat-, solvent-, or vapor treatment is carried out, /5  
the string folds together in a tight crimp in a very short period of time, whereas its length is reduced to 20% of the original volume. The remaining piece is so short that it does not interfere during further processing, whereas yet another advantage is that, in view of the brevity of the crimped-together string clew, pressing it into the rear end of the tampon can be dispensed with,



as has been standard procedure, at least, with rolled tampons. With the string that is crimped together in accordance with the invention, it is entirely sufficient to lightly place it against the rear end and to then package the finished tampon. This has the advantage that, when the tampon is used, the end of the string is more easily found and grasped, and the string does not have to be pulled out of the rear end of the tampon into which it was otherwise pressed.

Before the tampon is used, the crimping of the retrieval string which is structured and treated in accordance with the invention can easily be cancelled by pulling the string in longitudinal direction. During this process, it experiences a stretching which is irreversible at room temperature, which can be carried out without any considerable expenditure of force and is sufficient to cancel the crimping and to smoothly transfer it into its normal position of use.

All shrinkable string materials known to the art are suitable for the manufacturing of tampons with retrieval strings that are composed in accordance with the invention. These specifically include polyester, polyamide, polyacrylonitrile, polyolefins, as well as their derivatives. Depending upon the molecular structure, degree of polymerization and pretreatment, the optimal shrinkage temperature varies somewhat. However, the required temperatures can easily be determined through tests and, besides that, are known

from literature. Exemplary reference is made to the book by Franz /6  
Fourné, "Synthetic Fibers", 1964, page 309.

To carry out the crimping, the process is such that the tampon is subjected to the shrinkage treatment, at least, in the area of the retrieval string. This shrinkage treatment may consist of the string being heated to the shrinkage temperature of the shrinkable material which is used. Tests have shown that the entire tampon or preformed tampon including the retrieval string can be subjected to the heat treatment without incurring any damage. This is so because the tampon has considerable heat insulating capabilities, so that the retrieval string is sufficiently shielded from the supplied heat in the area of the absorbent body and is kept from shrinking there. The shrinkage then only occurs in the area of the retrieval string which projects from the absorbent body and results in the desired crimping there.

The heating of the tampon's retrieval string can be carried out in the manner known to the art with infrared radiators, or by blowing with a heated gas or vapors. Finally, it is also possible to carry out the heat application in a high-frequency electric field, whereas the process applied must depend on the respective machinery conditions.

In the attached drawing, the subject of the invention is explained by means of the example of a rolled preformed tampon with a retrieval string that is sewed on and sewed-up over its length.

Shown are:

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Figure 1 depicting a preformed tampon with a retrieval string in untreated condition;

Figure 2 depicting a preformed tampon with a retrieval string in heat-treated and crimped condition;

Figure 3 depicting an enlarged representation of the retrieval string according to Fig. 1 with an assymmetrically arranged string seam;

Figure 4 depicting an enlarged representation of a cross-section through a retrieval string which is built up of four intertwined individual strings of which one consists of a shrinkable plastic material.

The rolled preformed tampon (1) exhibits the retrieval string (3) which projects on its bottom end (2). On the inside of the winding lap, the retrieval string is firmly connected with the absorbent body (1). On its outermost end, it exhibits a knot (4) which is of service for a secure grasp when the tampon is retrieved.

In the represented example, the retrieval string (3) is sewed up with its string of shrinkable yarn over its entire length. The created seam is shown at (5); it extends assymmetrically to the cross-section of the retrieval string.

Figure 2 depicts the preformed tampon in the heat-treated condition of the retrieval string. It can be deduced that the

string (3) is shrunk into a clew, the length of which is substantially reduced compared to its original length.

An enlarged lateral view of the retrieval string according to Fig. 1 is shown in Fig. 3. There, it can be deduced that the retrieval string consists of several individual strings (7) which are intertwined with one another. Moreover, the retrieval string is sewed up with a seam string (8) over its entire length, which consists of a shrinkable organic plastic material. The seam is /8 arranged asymmetrically to the length of the retrieval string which enhances the desired coiling effect upon shrinkage of the seam string (8).

Figure 4 depicts an alternate form of the retrieval string in an enlarged cross-section. There, three individual strings (9) of an unshrinkable material are intertwined with an additional string (10) which is made of a shrinkable organic plastic material. This kind of retrieval string structure also shrinks into the coil that is depicted in Fig. 2 upon heat treatment or also during the treatment with solvent vapors.

In the following text, the invention will be explained by means of a configuration example.

To produce a rolled tampon, a synthetic wool-cotton-wadding tress was used as the basis, which, initially was sewed up in its middle with a retrieval string of a total length of 180 mm and 124-132 mm of free length. The retrieval string consisted of cotton of

the metric number 8/4. This means that four individual strings were intertwined into the overall string of which each weighed 1 gramm at a length of 8 meters. The retrieval string was sewed up on an automated tampon sewing machine with a high-shrinkage polyester yarn (dtex 100/triple) in longitudinal direction, whereas the stitch length was 3 mm.

After the seam had been finished and the end-knot was attached, the cotton tress was wound into a preformed tampon and the string was then heated to a temperature of 110°C for a period of 5 seconds. During this process, it shrunk together in the manner that can be deduced from Fig. 2, whereas a crimped coil formed. This test was repeated several times; the individual dimensions which resulted in this process of both the original string and the shrunk and crimped string can be deduced from the following compilation: /2

Original length of retrieval string in mm (free length)	Length of shrunk retrieval string in mm		Number of bends relative to the length of the lax retrieval string
	drawn	undrawn	
125	77	28	5
124	78	25	6
132	78	20	6
128	79	21	5
130	80	29	5
132	81	22	6

1. Tampon for feminine hygiene consisting of an absorbent body with a retrieval string attached to it, characterized by the fact that,  
at each point of its longitudinal extension, the retrieval string (3) partially consists of a material which does not shrink during heat treatments and partially consists of an organic plastic material which shrinks under heat treatments.

2. Tampon, in accordance with Claim 1,  
characterized by the fact that,  
the retrieval string (3) consists of cotton, synthetic wool, or a similar material and is sewed up with, at least, one string of a shrinkable material over its entire length.

3. Tampon, in accordance with Claim 2,  
characterized by the fact that,  
the seam (5) is arranged asymmetrically in relation to the tampon's cross-section.

4. Tampon, in accordance with Claim 2,  
characterized by the fact that,  
the string of the shrinkable organic material connects the retrieval string (3) with the absorbent body (1).

5. Tampon, in accordance with Claim 1,  
characterized by the fact that,

the retrieval string (3) is composed of several intertwined strings of which, at least, one consists of a shrinkable organic material.

6. Tampon, in accordance with Claim 1,

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characterized by the fact that,

the retrieval string (3) consists of, at least, one bicomponent string, one component of which is an organic plastic material which does not shrink under heat treatment and the other component of which is an organic plastic material which shrinks under heat treatment.

7. Process for crimping the retrieval string of a tampon in accordance with, at least, one of Claims 1 to 6,

characterized by the fact that,

the tampon, at least, in the area of the retrieval string, is heated to the shrinkage temperature of the shrinkable material that is used.

8. Process, in accordance with Claim 7,

characterized by the fact that,

the heating is carried out by irradiation with infrared rays.

9. Process, in accordance with Claim 7,

characterized by the fact that,

the heating is carried out by blowing a heated gas or vapor.

10. Process, in accordance with Claim 7,

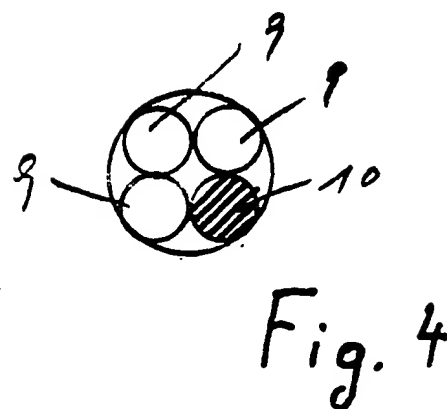
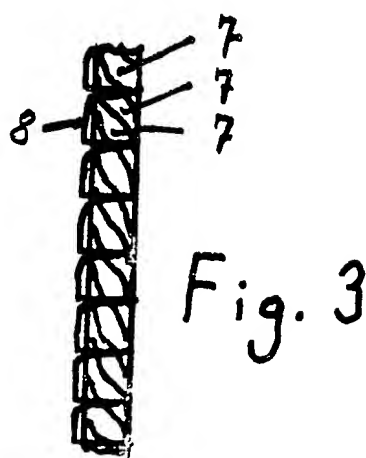
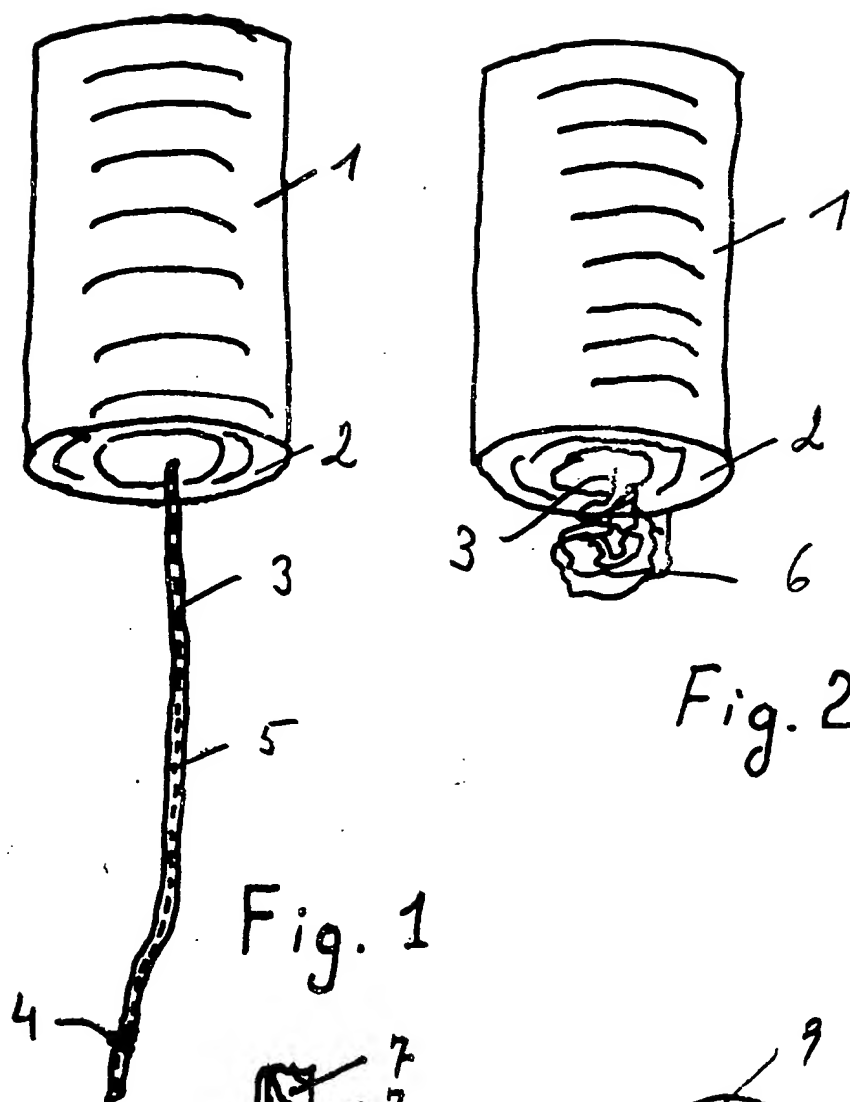
characterized by the fact that,

the heating is carried out in a high-frequency electric field.



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